definite direction, to other parts of the coast, and that the fish supply of a given area of the territorial waters on the east coast may be derived, not from the spawning areas *ex adverso*, but from those situated further north.

THE LIFE-HISTORIES AND DEVELOPMENT OF THE FOOD FISHES.

The report contains an important paper by Prof. M'Intosh, giving the results of his continued investigations on the eggs, young, and development of several of the food fishes, the work having been carried on, as in previous years, at St. Andrews Marine Laboratory. The principal investigation relates to the development of the turbot, which has now for the first time been elucidated, fertilised eggs having been procured from the hatchery. The ripe egg of the turbot has an average diameter of 1·0287 mm., and is perfectly buoyant, floating at the surface of still water or suspended midway, and it possesses a prominent oil-globule. The embryonic fish, which is of a reddish colour, emerges from the egg about the sixth or seventh day, so that the period is short before hatching occurs. The larvæ in a few days become active and dart rapidly through the water, and they are hardy; the yolk-sac becomes absorbed about the seventh day, and thereafter they feed for themselves, being extremely quick in noticing the movements of the minute crustaceous and other forms in the water around them. Prof. M'Intosh states that no form hitherto observed at St. Andrews appeared to be more hardy, or to undergo the vicissitudes of temperature and manipulation with greater impunity than the young turbot; there are grounds, therefore, for expressing the hope that they may yet be reared in great numbers from the post-larval to the adolescent and adult condition in suitable enclosures. The various stages in the development of this valuable form are described and figured. Another species whose development is described is the long rough dab, the pelagic eggs of which are found in considerable abundance in March and April.

Mr. H. Charles Williamson contributes an elaborate paper on the reproduction of the common eel, which has been, and still is, in many respects, involved in considerable obscurity. He gives a very full account of the reproductive organs, both as described by other naturalists, and as observed by himself in a number of specimens examined at St. Andrews; and the paper includes a description of the migrations of the eel, and all that has been ascertained about its spawning. It is a remarkable fact that the ripe egg of the eel has never yet been discovered.

Mr. Williamson also gives a detailed account of the distribution of the pelagic eggs and larvæ of various species of food fishes, obtained in tow-nets, including those of the plaice, haddock, cod, whiting, saithe, sprat, dab, turbot, gurnard, long rough dab, flounder, &c. In another paper he describes the variation in the size of the eggs of a number of the food fishes. Dr. Fullarton has also furnished an elaborate description of the larval and post-larval development of the brain in the lesser sand-eel (*Ammodytes tobianus*), accompanied by illustrations. The important subject of the rate of growth of fishes is at present receiving considerable attention in connection with fishing questions. In the present report Mr. Arthur T. Masterman gives the result of his researches on the subject at St. Andrews, dealing especially with the rate of growth of the plaice.

Mr. Harald Dannevig also furnishes an account of the experiments he has made in regard to the influence of variations of temperature in accelerating or retarding the development of the eggs of fishes. The species dealt with were the plaice, cod, haddock, whiting and flounder.

Finally, the report contains a paper, by Mr. Thomas Scott, on the fauna of the Firth of Forth area and of inland waters; Mr. A. J. Herbertson contributes an elaborate paper, accompanied by numerous tables, dealing with the physical observations on the temperature and density of the sea; and Dr. Wemyss Fulton gives an account of the scientific fishery work and the condition and regulation of the sea fisheries in other countries possessing them, and of the principal methods employed to protect and develop them.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. A. R. Forsyth, F.R.S., Sadlerian Professor of Pure Mathematics, has been appointed by the Council of the Senate a member of the Governing Body of Eton College, in the room of Dr. Ferrers, F.R.S., resigned.

An Isaac Newton Studentship in Astronomy and Physical Optics will be vacant in the ensuing Lent term. The studentship is of £200 per annum for three years. Candidates must be at least B.A.s of the University, and under the age of twenty-five on January 1, 1896. Their names should be sent to the Vice-Chancellor between January 14 and 24 next, together with statements as to course of study or research proposed in each case.

The Observatory Syndicate report that they have abandoned the expectation of receiving public subscriptions for the proposed photographic telescope. They now contemplate the erection of a triple apochromatic telescope, the objective of which is to be furnished by Messrs. Cooke, of York, at a cost of £550. The tube of the instrument will be hinged, the larger part of the tube with the eye-piece lying in the polar axis. The rays from the objective at the end of the short movable part of the tube will fall on a flat mirror at the hinge, and be thence reflected to the eye-piece. The flat mirror will be furnished as a gift by Dr. Common, and Sir Howard Grubb is to be entrusted with the construction of the tube at a cost of £1100. The necessary moneys it is proposed to draw from the Sheepshanks Funds, and the Syndicate ask the Senate to sanction this appropriation.

Prof. Ewing, F.R.S., has been appointed Chairman of Examiners for the Mechanical Sciences Tripos, 1896. Among the annual appointments of members of the various Boards and Syndicates are the following:—Mr. Glazebrook, F.R.S., General Board of Studies; Mr. W. Gardiner, F.R.S., and Mr. W. Bateson, F.R.S., Botanic Garden Syndicate; Mr. Love, F.R.S., Library Syndicate and Observatory Syndicate; Mr. Heycock, F.R.S., Museums Syndicate; Dr. Hobson, F.R.S., Proctorial Syndicate, and Mathematical Board; Mr. Capstick, Highest Grade Schools; Prof. Bradbury and Dr. Shore, State Medicine; Dr. D. Hill, Agricultural Science; Mr. Shaw, F.R.S., Fire Prevention, and Board for Physics and Chemistry; Dr. A. MacAlister, Special Board for Medicine; Dr. Gaskell, F.R.S., Board for Biology and Geology.

It is proposed to invite representatives of the chief educational authorities and institutions to meet in Cambridge during the ensuing Long Vacation, in order to confer on questions arising out of the Report of the Royal Commission on Secondary Education. The Vice-Chancellor, on behalf of the University, will convene the conference.

THE Calendar of the University College, Nottingham, for the fifteenth session, 1895-96, has been issued.

THE following are among recent appointments:—Dr. J. Munk to succeed Dr. Gad at the Berlin Physiological Institute; Dr. Paul Kempf and Dr. Wilsing, of the Potsdam Astrophysical Observatory, to be Professors; Prof. Theel, of Stockholm, to be Director of the Natural History Museum there; Dr. Strahl, of Marburg, has been appointed to the chair of Anatomy in Giessen University.

THE *London Technical Education Gazette*—the official organ of the Technical Education Board of the London County Council—contains the following satisfactory announcement:—"It has been part of the policy of the Technical Education Board in connection with higher education, and will be, if possible, through the proposed Teaching University of London, when that University is established, to secure for students who can devote their evenings only to study, a course of instruction of the highest type in all branches for which provision is now made for day students in the universities and university colleges, and to provide that the teachers of these classes shall be the same professors as take the day classes, or others of equal standing. As a step in this direction the Board has arranged with the authorities of University College for the conduct of four courses of lectures and practical work in the departments of Mechanical Engineering, Electrical Engineering, Chemistry, and Applied Mathematics."

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, November 7.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read:—On flame temperatures and the acetylene theory of luminosity, by A. Smithells. The author criticises adversely Lewes's theory of the luminosity of hydrocarbon flames on the ground of experimental evidence.—A new series of hydrazines, by F. D. Chattaway and H. Ingle. The quaternary hydrazines of the general formula $R_2N.NR_2$ may be prepared from secondary amines by acting on the sodio-derivatives of the latter with iodine.—The action of certain acidic oxides on salts of hydroxy-acids (part ii.), by G. C. Henderson and D. Prentice. A number of crystalline compounds of antimonious and arsenious oxides with salts of citric, malic and mucic acids have been prepared.—Sodium nitrososulphate, by E. Divers aud T. Haga.—The constitution of nitrososulphates, by E. Divers and T. Haga. In these two papers the authors detail evidence showing that the nitrososulphates are true sulphates of the constitution $RON_2.O.SO_3K$.—Normal hexane from light petroleum (petroleum ether), by G. L. Thomas and S. Young. Employing their recently described form of dephlegmator, and treating the fractions with mixed nitric and sulphuric acids, the authors have been able to separate an almost pure sample of normal hexane from light petroleum.—The vapour pressures, specific volumes and critical constants of normal hexane, by G. L. Thomas and S. Young. The critical temperature, pressure and volume of a gram of synthetic normal hexane are 234°.8, 22510 mm. and 4·268 c.c. respectively: the oil boils at 69°·0 under 760 mm., and has the specific gravity 0·67696 at 0°.—Acidylthiocarbimides, by A. E. Dixon.—Some constituents of the root of *Polygonum cuspidatum*, by A. G. Perkin. From the roots of this plant, which is a native of China and Japan, the author has separated a new glucoside, cuspidatin, $C_{21}H_{20}O_{10}$, which yields emodin on hydrolysis; a second glucoside, emodin, and a wax were also isolated.—Note on the action of hydrofluoric acid upon crystallised silicon, by G. S. Newth. Gaseous hydrogen fluoride causes the ignition of warm crystallised silicon.—Note on the periodides of theobromine, by G. E. Shaw. The author has prepared four new periodides of theobromine and its hydrochloride.—A synthesis of diphenyloxytriazoline, by G. Young.—Note on piperovatine, by W. R. Dunstan and F. H. Carr. Piperovatine may be rapidly extracted from *Piper ovatum* by percolating the material with ether.—Dibenzaconine and tetracetylaconine, by W. R. Dunstan and F. H Carr.—Molecular volume change during the formation of dilute solutions in organic liquids, by A. W. Jones. A series of determinations of the volume changes occurring when a number of liquids are dissolved in benzene and carbon disulphide have been made.

Royal Meteorological Society, November 20—Mr. R. Inwards, President, in the chair.—A paper by Mr. J. Eliot, F.R.S., was read, on the origin of the cold weather storms of the year 1893 in India, and the character of the air movement on the Indian seas and the equatorial belt, more especially during the south-west monsoon period. This was really a discussion of the data contained in the *Indian Monsoon Area Charts*, the publication of which was sanctioned by the Indian Government for the two years 1893-4. Cyclonic storms are of frequent occurrence during both the north-east and the south-west monsoons, but they differ in many important respects. The storms of the south-west monsoon originate almost invariably over a sea surface, and travel in very variable directions, and occasionally develop into intense and furious hurricanes. The cyclonic storms of the north-east monsoon almost invariably originate over the plateau of Persia or Baluchistan, or in North-Western India, and travel in an easterly direction at a velocity ranging between fifteen and twenty miles per hour. These plateau-formed storms of the cold weather are the chief instruments of the distribution of the moderate rainfall essential for the great cold weather wheat and other crops of Northern India, and are the chief sources of the snowfall of the Western Himalayas. After giving an account of the more important cold weather storms in January and February 1893, and the results of the tabulation of the wind observations for the equatorial belt, the author describes the "burst of the monsoon." Mr. Eliot says that the evidence of the year 1893 is strongly in favour of the supposition that the south-west monsoon currents in the Indian seas are the direct continuation north of the equator of the horizontal movement of the south-east trade winds; and that the larger variations in the strength of the south-east trades near the equator during the monsoon period are reproduced in the monsoon currents in the Indian seas from June to September.—Mr. W. H. Dines showed an interesting experiment to illustrate the formation of the tornado cloud. The characteristic funnel cloud was readily seen extending from the tray of hot water to the mouth of the pipe at the top of the box, and when the draught was strong and the conditions favourable, a decided protuberance was observed on the surface of the water just under the end of the cloud. Mr. Dines is of opinion that the cloud is formed by true dynamic cooling as the air, saturated by the vapour from the hot water, comes under the influence of the decreased pressure at the centre.—A paper by Mr. C. Davison was also read, on the diurnal variation of wind velocity at Tokio, Japan.

Malacological Society, November 8.—Prof. G. B. Howes, President, in the chair.—The following communications were read:—Descriptions of new species of terrestrial and fluviatile mollusca from the Hadramaut, South Arabia, by J. C. Melvill and J. H. Ponsonby.—Notes on the anatomy of *Hanleya abyssorum*, M. Sars: (*a*) on the presence and position of an osphradium; (*b*) general notes, by R. H. Burne.—Description of a new species of the genus *Cassis*,, by G. B. Sowerby.—Description of a new species of *Vitrina* and new forms of *Helicidæ* together with a list of the Helicoid land-shells hitherto found in the Canary Islands, by G. K. Gude.—Description of a new species of *Streptaxis*, by G. K. Gude. Specimens in illustration of their respective papers were exhibited by the authors.—Mr. Da Costa exhibited a series of land-shells from the Galapagos Islands. Mr. Moss exhibited a white *Helix perplexa*, Fér., from Grenada.—Mr. Sykes exhibited land-shells from a deposit at Blashenwell, Dorset.

PARIS.

Academy of Sciences, November 25.—M. Marey in the chair.—On para-ethoxyquinoline, by M. C Grimaux. The production and properties of para-ethoxyquinoline and some of its derivatives are described Conforming to Skraup's nomenclature, the name quinethol is given to this substance and its derivatives are termed nitroquinethol and amidoquinethol.—Observations of small planets, made with the great equatorial of Bordeaux Observatory, by MM. G. Rayet, L. Picart, and Féraud.—M. Lannelongue has been nominated by vote as member of the Medicine and Surgery Section of the Academy.—The rapid estimation of nitric nitrogen in vegetable products, by M. P. Pichard. The method is a colorimetric process based on the colouration produced when nitric acid acts on brucine.—Observation of the new comet Perrine (November 16, 1895), made at Marseilles Observatory, by M. Esmiol.—The polar snows of Mars, by M. Camille Flammarion. A comparison of some observations by the author with observations recorded at Lick Observatory.—On the displacement of a trihedral trirectangle around its summit, the position of this trihedral figure depending on two parameters, by M. Maurice Fouché.—On the electro-capillary properties of dilute sulphuric acid, by M. Gouy.—Action of phenol on mercurous iodide, by M. Maurice Francois. It is shown that phenol has a similar action on mercurous iodide to that of aniline. A certain proportion of the salt is decomposed to mercuric iodide and mercury until a state of equilibrium is set up between this action and the reverse action. Equilibrium obtains when 100 grams of solution contain 2·75 grams of mercuric iodide.—On manganese silicide, by M. Vigouroux. The compound $SiMn_2$ has been produced (1) by the direct action of silicon on the metal, (2) by the action of silicon on the oxide, (3) by the action of carbon on a mixture of silica and oxide. It is a very hard and sonorous substance of metallic lustre, and perfectly crystallised. Its aspect is steel-grey, density at 15° = 6·6, and it is unalterable in the air and fusible at the temperature of the reverberatory furnace. The chemical properties are given in detail in the paper.—On the toxicity of acetylene, by M. L. Brociner. A note calling attention to some of the author's work published in 1887, and prior to the recent publication on this subject of M. Gréhant.—On some reactions of tartaric acid and alkaline tartrates, by M. L. Magnier de la Source.—On the morphological interpretation of double larvæ in composite Ascidians of the genus *Diplosoma*, by M. Maurice Caullery.—On the effects produced on the rabbit and pigeon by the extraction of the stapes or of the columella and the experimental lesion of the membranous vestibule, by M. Garnault.—Laccase in fungi, by MM. Em. Bourquelot and G. Bertrand.—On the distribution of nitrogenous and mineral matters in bread, by M. Balland.

BERLIN.

Physiological Society, October 25.—Prof. du Bois Reymond, President, in the chair.—Dr. René du Bois Reymond gave an account of experiments made in repetition of Martin's, on the action of the internal intercostal muscles. He confirmed the conclusions arrived at by this investigator, but he more particularly limited his experiments to an examination of the internal intercartilaginous intercostals. It appeared that the latter, in opposition to the expiratory action of those between the ribs, have an inspiratory function, and contract synchronously with the diaphragm. After an artificial apnœa they enter again into activity at a slightly later period than does the diaphragm, resembling in this the inspiratory external intercostals. Dr. Rawitz recommended the employment of a very dilute solution (three to five drops of the concentrated ammoniacal solution in 30 to 50 c.c. of distilled water) of either hæmatoxylin or hæmatein, when these are used for staining, either alone or as subsequent to the use of eosin. The sections should lie in this solution for twenty-four to forty-eight hours. He then spoke on the use of alizarin and alizaro-cyanin for histological purposes. These substances can only be used with a mordant, of which a chromium salt was found to be most efficient with the former stain, and a salt of iron with the latter. In this way very brilliant permanent stainings may be obtained, which are particularly suited for the investigation of nuclear division.—Dr. Benda exhibited some striking preparations of neuroglia, obtained by a method to be described later on.

Physical Society, November 1.—Prof. du Bois Reymond, President, in the chair.—Dr. Claude du Bois Reymond exhibited specimens of colour-photographs, made by Dr. Joly, of Dublin, and described how they had been obtained. Dr. Rubens gave an account of experiments made by D. C. Cole on the refractive index of water and alcohol for electrical rays of short wave-length. Having failed to obtain any results with a prism for rays of 5 cm. wave-length, he used Fresnel's formula and the reflexive powers of these fluids for vertical and parallel polarised rays. In this way he found that for water the coefficient for rays of the above wave-length is the same as for rays, as previously investigated, of 10 cm. and of 60 cm. In the case of alcohol it was markedly less for rays of shorter than for those of greater wave-length. The method was also applied to petroleum, and gave results similar to those previously obtained for this liquid by other methods.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, DECEMBER 5.

ROYAL SOCIETY, at 4.30.—Studies in the Morphology of Spore-producing Members. Part II. Ophioglossaceæ: Prof. F. O. Bower, F.R.S.—On the Weight of a Cubic Decimetre of Water at its Maximum Density: Prof. Mendeleeff, For. Mem. R.S.—The Measurement of High Potential Difference: H. C. Leake, R. Leventhorpe, and C. S. Whitehead.—Variations in the Electromotive Force of Clark Cells with Temperature: Prof. Ayrton, F.R.S., and W. R. Cooper.

LINNEAN SOCIETY, at 8.—On a New Species of Bromus in Britain: G. C. Druce.—Notes on New or Rare Phasmidæ in the Collection of the British Museum: W. F. Kirby.

LONDON INSTITUTION, at 5.—Old Musical Instruments: A. Dolmetsch.

CHEMICAL SOCIETY, at 5.—The Constitution of Terpenes: Prof. Armstrong, F.R.S.—New Derivatives from α-dibromo Camphor: Dr. M. O. Forster. The Chemistry of Dibromopropyl Thiocarbimide, and the Action of Bromine and Iodine on Allyl Thiourea: Prof. A. E. Dixon.—Ballot for the Election of Fellows.

SOCIETY OF ANTIQUARIES, at 8.30.

FRIDAY, DECEMBER 6.

GEOLOGISTS' ASSOCIATION, at 8.—Notes on Indian Geology, including a Visit to Kashmir: W. H. Hudleston, F.R.S.

QUEKETT MICROSCOPICAL CLUB, at 8.

SUNDAY, DECEMBER 8.

SUNDAY LECTURE SOCIETY, at 4.30.—Lecture by Sir B. J. Richardson, F.R.S.

MONDAY, DECEMBER 9.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration in the Central Alps of Japan: Rev. Walter Weston.

SOCIETY OF ARTS, at 8.—Mechanical Road Carriages: W. Worby Beaumont.

TUESDAY, DECEMBER 10.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—The Recording of High Temperatures by Photographic Means: Prof. W. C. Roberts-Austen, C.B., F.R.S.—A New Form of Apparatus for Measuring the Densities of Photographic Plates: Chapman Jones.

ROYAL VICTORIA HALL, at 8.30.—The Rhine: Prof. H. G. Seeley, F.R.S

ROYAL ASIATIC SOCIETY, at 3.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Discussion upon the Papers by Messrs. Arnold and Wrightson, on the Physical Properties of Iron and Steel.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—The Game of Teetotum, Queensland: R. Etheridge.—Notes on Australian Shields, more particularly the Drunmung: R. Etheridge.—Stone Cooking-Holes and Grooves for Stone-Grinding, used by the Australian Aborigines: R. H. Mathews.—The Burbung of the Wiradjuri Tribes: R. H. Mathews.—The Bora, or Initiation Ceremonies of the Kamilaroi, Part II.: R. H. Mathews.

WEDNESDAY, DECEMBER 11.

SOCIETY OF ARTS, at 8.—Adjourned Discussion on Mr. Cunynghame's Paper on Locomotive Carriages for Common Roads.

PHARMACEUTICAL SOCIETY, at 8.30.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.

LONDON INSTITUTION, at 6.—The New Far East: Arthur Diósy.

SOCIETY OF ANTIQUARIES, at 8.30.

MATHEMATICAL SOCIETY, at 8.—Note on the Convergency of Series: Dr. R. Bryant.—Sexdecimic Residuality of 2: Lieut.-Colonel Allan Cunningham, R.E.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

FRIDAY, DECEMBER 13.

ROYAL ASTRONOMICAL SOCIETY, at 8.

MALACOLOGICAL SOCIETY, at 8.—The Culture of the Edible Oyster: Prof. Herdman, F.R.S.

CLINICAL SOCIETY, at 8.30.

PHYSICAL SOCIETY, at 5.—A Mechanical Device for performing the Temperature Corrections of Barometers: Dr. John Shield.—On the Existence of Earth-Air Electrical Currents: Prof. A. W. Rücker, F.R.S.

EPIDEMIOLOGICAL SOCIETY, at 8.

SATURDAY, DECEMBER 14.

ROYAL BOTANIC SOCIETY, at 3.45.

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